



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/922,852	08/18/2000	Dariusz Divsalar	06618/503001/CIT 3057	8254
20985	7590	04/06/2004	EXAMINER	
FISH & RICHARDSON, PC 12390 EL CAMINO REAL SAN DIEGO, CA 92130-2081			BAKER, STEPHEN M	
			ART UNIT	PAPER NUMBER

2133

DATE MAILED: 04/06/2004

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/922,852

Applicant(s)

DIVSALAR ET AL.

Examiner

Stephen M. Baker

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 13-68 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-10 and 13-68 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 3, 29, 33, 34, 40, 49-56 and 61 are objected to because of the following informalities:

In claim 3: "said first encoding is carried out by a first coder with a rate less than 1," is apparently unnecessary, as claim 1 specifies the first encoding as a repetition coding.

In claim 29: ", or substantially equal to," apparently should be deleted as unnecessary.

In claim 33: "converts" apparently should be "convert".

In claim 34: "are" apparently should be "is".

In claim 40: "with a rate less than one" is apparently unnecessary.

In claims 49-56: "A coder" apparently should be "A system".

In claim 61: "carried" apparently should be "carried out".

Appropriate correction is required.

2. Claims 10, 17, 18 and 23 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claims, or amend the claims to place the claims in proper dependent form, or rewrite the claims in independent form.

In claim 10: "x encoding operations" apparently should be "more than one additional encoding operations", in view of claim 9, otherwise no further limit is provided.

Art Unit: 2133

In claim 17: defining the first encoding as a "repetition code" apparently does not further limit claim 1.

In claim 18: "said first encoding is via a concatenation of short block codes" apparently does not further limit claim 1 wherein the "first encoding" is apparently a repetition code.

In claim 23: as the phrase "uses a matrix" apparently refers to a mathematical model of the permuting function of any interleaver, and as an interleaver presumably possesses a bit permuting function, no further limit to claim 19 is apparent.

Claim Rejections - 35 USC § 112

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 2, 14, 18, 24, 25, 34, 35, 38, 46 and 56-68 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2: "said encoding" apparently should be "said second encoding", to provide an unambiguous antecedent basis.

In claim 14: "decoding" apparently should be "coding".

In claims 24 and 25: defining a device which performs no permutation as an "interleaver" is not consistent with accepted terminology in the coding art.

In claim 34: "said coding" lacks an unambiguous antecedent basis.

In claims 38 and 53: "said middle coder is an interleaver and has a rate of one" apparently should be "said middle coder is coupled to a further interleaver and has a rate of one" because referring to an "interleaver" as a "coder" is considered to be confusing in the context provided.

In claim 46: "further comprising a plurality of said middle coders" apparently should be "wherein said second coder comprises a plurality of middle coders".

In claim 56: "said coder" lacks an unambiguous antecedent basis.

In claim 58: "method" apparently should be "system".

In claim 59: in line 6, "said data" lacks an unambiguous antecedent basis; referring to an "interleaver" as performing a "coding" step is considered to be confusing in the context provided; in lines 11-12, "linear structure which extends directly from input to output without recombinations or branches back" is vague in the context of claims 64 and 65 and in view of the disclosure which indicates that the coding system is not "recursive" between coders (p. 5, lines 19-20), but may include "recursive" encoders.

In claims 60 and 61: "said coding" lacks an unambiguous antecedent basis.

Claim Rejections - 35 USC § 102

5. Claims 1-5, 7-10, 13-25, 27-32, 34-41, 43-50, 52-63, 65 and 66 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,044,116 to Wang (Wang).

Wang discloses an encoding arrangement including a "first encoding" (BIT REPETITION) that "repeats", followed by an "interleaving" (SECOND ENCODER

INTERLEAVER), followed by a “second encoding” (SECOND ENCODER) that apparently has a rate =1 (Fig. 6), not considering tail bits or puncturing.

Regarding claim 2, Wang’s second constituent encoder (SECOND ENCODER) is apparently a “linear transformation” as it is apparently a convolutional recursive encoder (col. 2, line 4).

Regarding claims 3 and 29, Wang’s first constituent encoder (FIRST ENCODER) provides a “middle coder which carries out coding with a rate less than or equal to one”, not considering puncturing.

Regarding claim 4, Wang’s first constituent encoder (FIRST ENCODER) is a “q,n coder”, also considering tail bits.

Regarding claim 5, as Wang’s first constituent encoder (FIRST ENCODER) is apparently also a convolutional recursive encoder, it provides a form of “accumulator”.

Regarding claims 7, 27, 43, 52, 63 and 65, as g^0 and g^1 are apparently the connection polynomials for Wang’s convolutional recursive encoders (FIRST ENCODER, SECOND ENCODER), the polynomial representation “111” as a denominator term apparently corresponds to a transfer function “ $1/(1+D+D^2)$ ”.

Regarding claim 8, considering the combination of Wang’s first and second constituent encoders as the “second encoding”, “two accumulators” are apparently provided.

Regarding claims 9 and 10, Wang’s first constituent encoder (FIRST ENCODER) provides “at least one additional encoding operation” besides that of the second constituent encoder (SECOND ENCODER).

Regarding claim 13, Wang provides “a plurality of interleaving operations” (SYSTEMATIC INTERLEAVER, FIRST ENCODER INTERLEAVER, SECOND ENCODER INTERLEAVER).

Regarding claims 14 and 31, including Wang’s 1:3 splitting junction as a “coder”, Wang shows a total of four coders and three interleavers.

Regarding claim 15, Wang further shows a puncturer (PUNCTURE PATTERN) for “puncturing bits, at specified intervals, to chance the effective rate of the inner coder”.

Regarding claims 16, 34, 35, 60 and 61, Wang’s first and second constituent encoders (FIRST ENCODER, SECOND ENCODER) are “on separate branches of a tree structure”, as they are a parallel concatenation.

Regarding claims 18 and 45, Wang’s multiple repetition coding can be viewed as a concatenation of “short block codes” that are single repetition codings.

Regarding claim 28, considering the combination of Wang’s first and second constituent encoders as the “second encoding”, “an accumulator which accumulates twice” is apparently provided.

Regarding claims 30 and 32, Wang’s 1:3 splitting junction and second constituent code interleaver apparently constitute “a plurality of said middle coders” and the combination of a repetition encoder with a 1:3 splitting junction apparently constitutes “a concatenation of a plurality of short block coders”, as applicant apparently defines such.

Regarding claim 39, $k = n$ for Wang’s interleaver (SECOND ENCODER INTERLEAVER).

Regarding claims 41 and 49, as Wang's second constituent encoder (SECOND ENCODER) is apparently a convolutional recursive encoder, it provides a form of "accumulator".

Regarding claim 44, considering the combination of Wang's first and second constituent encoders as an "inner coding", "an accumulator which accumulates twice" is apparently provided, and as the rate of both encoders combined is $\frac{1}{2}$, the combination is "substantially rate one" as applicant defines such (p. 5, line 17).

Regarding claim 50, as Wang's second constituent encoder (SECOND ENCODER) is apparently a convolutional recursive encoder, it provides a form of "digital filter with a specified transfer function".

Regarding claim 54, Wang's 1:3 splitting junction and second constituent code interleaver provide "at least one additional coder and at least one interleaver, said additional coder having a rate less than one and coding according to an (n,k) code", where $n=3$ and $k=1$.

Regarding claims 56-58, Wang's constituent coders (FIRST ENCODER, SECOND ENCODER) are linear "accumulators" on separate "branches" and there is no "recurring back or recombining" between "branches" *per se*.

Regarding claim 66, Wang's turbo decoder use "*a posteriori(i)*" decoding techniques (Fig. 7).

6. Claims 19, 20, 23, 24, 26, 29, 36-39, 41, 42, 46, 48-51, 53, 58-60, 62 and 64 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,032,284 to Bliss (hereafter Bliss).

Bliss discloses encoding for a magnetic disk channel. Bliss shows (Fig. 3) an inner coder (B10) with a transfer function " $1/(1+D)$ ". A middle coder comprises a trellis encoder (B6) with rate = 8/9 in one example (col. 14, line 3). An outer code (not shown) can comprise Reed-Solomon code that is block-interleaved to a depth of three (col. 22, lines 13-15). The rate of the Reed-Solomon code is presumably greater than 9/10.

7. Claims 19, 23-25, 29-33, 48, 53 and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,392,299 to Rhines *et al* (hereafter Rhines).

Rhines discloses encoding for a media channel. Rhines shows (Fig. 3) an inner coder (160) in the form of a Miller-squared media channel coder with a rate approximately equal to one, as applicant defines such. An outer coder (12) is a Reed-Solomon encoder with a rate approximately equal to one, followed by an interleaver (16). Middle coding is provided by two reed-Solomon encoders (90, 150) with another interleaver (110) interposed between.

Claim Rejections - 35 USC § 103

8. Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of the publication to Wiberg *et al*, "Codes and Iterative Decoding on General Graphs".

Wang does not discuss the operation of the turbo decoder specifically in terms easily identifiable as a "Tanner graph representation". Wiberg teaches turbo decoder operation in accordance with a Tanner graph representation, which was conventional in the turbo code art at the time the invention was made. It would have been obvious to a

Art Unit: 2133

person having ordinary skill in the art at the time the invention was made to implement Wang's turbo decoder "by using a Tanner graph representation". Such an implementation would have been obvious because turbo decoder operation in accordance with a Tanner graph representation was already conventional in the turbo code art and taught by Wiberg.

Allowable Subject Matter

9. Claim 6 is allowed.

Response to Arguments

10. Applicant's arguments filed 27 January 2004 have been fully considered but they are not persuasive.

Addressing the Wang patent, applicant draws a contrast between the disclosed invention and a typical "turbo code" encoder, noting that the inner code of the typical "turbo code" encoder has a higher rate than applicant's inner code. The claims do not include a comparison to a "turbo encoder", the examiner has specifically identified an inner code meeting the claimed inner code rate, and thus applicant's comparison does not appear to be of particular relevance.

Further addressing the Wang patent, applicant alleges Wang does not teach or suggest "a first encoder, interleaver, and second encoder, where the interleaver interleaves the bits from the first encoder and a (sic) second encoder has a rate approximately equal to one", however the presence of these elements in the disclosure

Art Unit: 2133

of Wang has been specifically identified in the rejection, and so applicant's allegation is apparently not well taken.

Addressing Bliss patent, applicant observes "Bliss is not (sic) a turbo coder", and that the encoding disclosed by Bliss "does not meet the limitations of the special outer coder, interleaver and inner coder where the inner coder has an output connected to the channel, however the presence of these elements in the disclosure of Bliss has been specifically identified in the rejection, and so applicant's allegation is apparently not well taken.

Addressing the Rhines patent, applicant apparently fails to appreciate that the rate-1/2 "Miller squared" media channel code suggested by Rhines is alone sufficient to support the error flagging performed in Rhines' media channel decoder 170, or that a rate-1/2 code is described by applicant's own disclosure as having a rate "close to one" (p. 5, line 17).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

Art Unit: 2133

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (703) 305-9681. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Stephen M. Baker
Primary Examiner
Art Unit 2133

smb